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MARCH, 1925

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Industrial Finishing

For Users of Fillers, Shellacs, Varnishes, Etc.

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With the Editor

IT is well within the memory of some individuals in the industry when it was customary for first class finishers and painters to mix up many of their finishing materials according to guarded formulas. In the absence of a variety of manufactured, ready-to-use materials of dependable and uniform quality, and due to limited publicity given to those materials that were available, this practice was only natural. It was costly in many respects, considering the way we count costs today, but then time was less of a factor, buyers were less discriminating, there was less competition, and there were fewer needs to supply.

Today, conditions are altogether different. The market now offers a variety of high-quality brands of finishes and paints for every industrial purpose. Interest and efforts have been stimulated by the increasing demands of modern industry and progress. Finishes and paints now available represent the combined efforts and co-operation of practical finishers, expert finish manufacturers and learned chemists, working in laboratories where every facility is at hand for conducting experiments, making analysis and tracing the causes of various finishing troubles.

Supplementing the sale of modern finishes and paints, is the manufacturer's service department which is always ready and eager to help out the user with special investigations, suggestions and recommendations. All this is worth a great deal to the user of finishes and paints. It places at his command the technical brains of the organization that supplies his materials. It saves him time, worry and expense. With the present-day materials, equipment, and service now available, what occasion is there for resorting to practices in vogue 25 or 30 years ago?

Commenting on this subject in a recent letter to the editor, a practical paint shop engineer and instructor in modern finishing, writes: "I have always advised against the use of any but the standard commercial finishes, paints and removers. All my practicing and teaching has been to the one end that large or small shops should use only the best goods, made by reputable firms. No matter what the price, these are the cheapest if you will only use them right and get all out of them that the manufacturer intends for them to do. It's not only my belief, but that of every one who uses his thinking apparatus, that our present day American manufacturers are doing their part, and if the goods are given a chance, wonders can be performed. The finishes should not be doped, doctored, etc. Cheap makeshifts have no place in the modern systems of finishing practice."

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Pushing Finishing Room Production

Directing attention to certain prevailing conditions in modern finishing rooms and explaining how to improve the management and how to make better use of the facilities and equipment available

By Service Supervisor

THE tremendous general increase in quantity production during and since the World War has demanded that finishing be speeded up to the limit. Every day manufacturers are laying out larger and quicker production schedules with a minimum of floor space and goods in process. Time is getting to be one of the most important considerations in the manufacture of all objects, and the finishing department is no exception to this rule.

This is reflected in demands for faster drying fillers, undercoaters, varnishes, enamels and general finishing materials of all kinds. The manufacturer of industrial finishing materials has serious burdens placed on his shoulders every day. He is called upon repeatedly to increase the speed with which his materials may be used, yet he must maintain the standard of durability and service as best he can in the face of all these demands. His is not an easy task.

Fortunately he has been able to call to his aid the use of higher temperatures, controlled humidity and ventilation, in the form of dry kilns and conditioned finishing rooms to hasten the drying of these coats, without sacrificing too many of the desirable qualities in a finish. In fact, for certain work, he is able to produce an even better finish with conditioned drying equipment than he could ever have produced under the old order of finishing. Every step that is taken by the user of finishing materials to improve the drying conditions is a step in favor of better finishing.

The finishing of many articles, such as pianos and automobiles, is very particular work; one of the worst things that can happen is to put into effect a schedule of finishing that will jeopardize the ultimate results. Yet, there is a common tendency to hurry the finishing more than any other branch of the work,. and always with bad results.

When one considers that hundreds of operations are involved in the manufacture of such products, and that months are required from the first use of raw materials to the finished, tested and inspected product, it seems out of place to rush the finishing to save a little time, especially since the average buyer is attracted first by style and beauty of finish, and almost invariably he condemns a product if the finish does not happen to be pleasing or durable.

There is another factor in finishing that is rapidly gaining in importance. It is the lack of thoroughly trained men in charge of finishing. The old time workman, fundamentally sound on finishing problems in his particular field, is apparently disappearing

and he is not being replaced. Young men no longer seem satisfied to go through the school of experience that educates them from the ground up on finishing problems, and today we find many men in charge of finishing who understand not as much of the fundamental principles as are sometimes needed to solve unexpected and perplexing problems.

Big manufacturing institutions are placing more and more dependence on the service and engineering departments of large varnish, paint and lacquer makers, who are able to gather together technical and practical experts from a great many fields to consult with each other and give help to users of finishing materials. These men are thoroughly posted in their respective fields; they know exactly what is safe and what is unsafe in the hastening of production, or on any other problems.

One of the common faults that sometimes creeps into large factories is the lack of individual responsibility. The majority of "straw bosses" and workmen are likely to become engaged in "passing the buck", rather than in controlling the speed and quality of production. A thoroughly competent, high-grade man with sufficient back bone and tact to compel respect for and obedience to his orders should be in charge of the finishing work, and he should be held personally responsible for results. This man, however, should not be of the overbearing lordly type for one of his most important jobs should be to give his workmen competent advice and instructions, so as to develop them into experienced men of sufficient calibre to, in turn, take charge of finishing problems.

This sort of supervision will prevent workmen from feeling that they can do as they please and get away with it. Also it will cause each man to do his work properly rather than to have the condition which is sometimes found, of the workman who next gets the part, evading trouble by merely doing his part of the work right on top of what has either been omitted or only partially done.

A rigid inspection should be given each part after every operation in the finishing room, as well as in other parts of the factory. No piece, which is not properly surfaced and ready for the finishing room, should be allowed to enter this department, for defects are usually more easily and satisfactorily repaired with less expense before the finishing operations have taken place. All defective work of any nature, which arrives at any department, should be turned back to the proper department for repairs rather than to proceed through to the finishing department before being stopped. Otherwise there is sure to be loss of time and material used in several operations, with resulting unnecessary expense and delay.

To aid the workmen in doing their work to the best possible advantage, the finishing room should be well lighted. Daylight is the best light, but where this is not available in sufficient quantities, properly designed artificial light should be used in conjunction with a good mill-white paint to aid in the illumination. Many factories that have worked along these lines consider such improvements a paying investment and not an expense.

The equipment in the finishing room should also be adequate and

well cared for to obtain the best results. Suitable ventilating and heating facilities should be installed to insure good working and drying conditions. Most finishing materials demand an abundant supply of oxygen and at least moderate temperatures for good drying. Draughts directly on the work should be avoided, however.

Brushes should be well cared for and kept clean. Spraying, dipping or flowing equipment also should be kept clean and in repair, or defective work is likely to result. Spray booths should be cleaned periodically and, in fact, everything in and around the finishing room should be kept scrupulously clean. This applies also to the compressed air lines which should be kept free from oil, water and dust by the use of suitable traps and condensers.

Proper equipment, conditions and personnel in the finishing room play a more important part than any other set of factors in the quantity and quality of work turned out. Often they are the deciding factors as to whether a business will be on a paying basis for, as pointed out before, the finish is the dress which attracts or repels the prospective purchaser. It determines to a great extent which of two objects of similar mechanical construction will be chosen.

De Vilbiss Opens Office in Chicago

An accessible down town office and display room has been opened in Chicago by the DeVilbiss Mfg. Co., of Toledo, Ohio.

At this new location, in the Republic building, is featured a well arranged display showing DeVilbiss spray-painting equipment, as well as a large stock of spray guns and other parts making up the equipment.

Finishing Breakfast Room Suites.

The decorating and finishing of breakfast room furniture is a subject in which every finisher and interior painter should be interested. Nearly every home today has its breakfast room or some odd nook that can be used as such. While perhaps the majority of people buy breakfast room furniture that is already finished, there are some who buy it in the white and have the pieces decorated to harmonize with the color scheme of the room.

There are many ways of doing this kind of work; also many grades of quality ranging from the high class hand decorated suites down to the low-priced enameled sets with stencil decoration. For large production and quick work, there is nothing better than the spray machine and cellulose lacquers, whereby two or three coats can be put on in one day.

In decorating breakfast room furniture, some do it by hand painting. The lower-priced goods are decorated by stenciling; others are ornamented by decalcomania, with perhaps some form of stripe or banding to give the suite a neater appearance.

Decalcomania offers a wide range of color schemes, and it represents an easy form of decorating, both for the factory finisher and the painter. After a little practice a man can apply these transfers quickly and easily. They are small in cost when purchased in large quantities. Begin by coating the front of the transfer with special varnish or shellac; when tacky, apply it to the surface. If the transfers are put on before the applied coating

becomes tacky, they will crack and peel off.

The condition of tackiness can be judged by testing the edge with the finger. Sometimes the edges let loose by not being tacky enough. In this event touch these loose edges with shellac, and when it is nearly dry press the loose edges down. After standing a short time the transfer can be touched up with a little oil color. and it will take an experienced eye to distinguish it from hand work.

The striping, of course, requires a skilled hand. Most of the low-priced suites are striped on the enamel. This is very unsatisfactory, because in a very short time the striping will rub off. The finisher or painter, doing breakfast room suites in the home, will find that unless he uses a spray it will be better to put on three coats of flat, then the decoration and striping, and follow up with shellac or two coats of good varnish.

Most breakfast room furniture is painted, but some people prefer a stain and some clear or semi-clear finish, to reveal the natural grain of the wood. This effect is easily obtained by using a stain soluble in water or alcohol. This stain will dry very rapidly, and after it is dry the surface can be shellaced or lacquered. Then stripe and decorate and finish as required.

There are many different colors that will produce a nice effect in breakfast rooms. Many breakfast rooms are being done in ivory with trimmings of blue or red. Blues make the most successful color, as it stays cleaner and lasts longer. However, colors and "make-up" that are attractive will sell any time.—J. K. Cooper.

Coating Chintz With Lacquer

Sometime ago a friend of mine who is in the furniture business had a serving tray in which the glass bottom had become broken. He is a great believer in wood lacquer as a durable finish, so when the glass became broken he had it removed from the tray and had two good coats of lacquer sprayed directly onto the chintz. It made a splendid job.

Here is a new field for the use of wood lacquers. Lacquer finish will stand a great deal of abuse, and it is bound to revolutionize furniture finishing, especially dining room furniture. Recently I was in a shop where lacquer is used under a trade-marked name, and the manager gave me a demonstration of some of the abuses furniture will stand when finished with this material. He had an electric coffee percolator on the table, and he allowed the water in the percolator to boil over onto the finish. When the water had dried off the table and the top had been wiped off with a cloth, there was not the slightest evidence of the finish having sustained any injury. Hot dishes do not injuriously affect it. The problem of a finish that would withstand the heat from hot dishes has been a great drawback to varnish, but lacquer seems to have solved the problem.

Now that it is known that chintz in serving trays can be successfully coated with lacquer, and will take the place of glass, it is quite likely that it will be used extensively for this purpose in the future. No doubt many other uses for this material will come to light as time goes by.—M. C. Wallace.

Finishing Steel Office Furniture

Describing in detail the preparation of steel office furniture for finish coats, and all the finishing, drying and smoothing operations involved in producing the standard olive green, grained mahogany and grained oak finishes

By Russell W. Brandt

IN the last few years the demand for steel office furniture has progressed with great rapidity, and even during the slack period of the past year these manufacturers were able to keep their plants running nearly to capacity.

While the manufacture of the "black stock", as the unpainted pieces are called, requires great accuracy and involves many interesting problems, the finishing of the pieces themselves is of equal if not greater importance. The durability and usefulness of the finished product depends on the finish to a greater extent than it is realized. The finish must protect the steel from rusting; it also must be one which will not chip off or scratch. The finish must stand knocks; it must stand up under constant usage and wear. It must be an ideal finish properly applied.

Spraying a vertical with spray gun.

The finishing of the all-steel vertical or filing cases, manufactured by the General Fireproofing Co., of Youngstown, Ohio, is a typical example of the care taken in the manufacture of the better grades of metal office furniture. The steel sheets are sheared to size, formed into pieces, and the body and drawers of the vertical are assembled. After assembling, the surfaces are thoroughly cleaned by benzine and then dried. Great care is taken to see that all dirt, oil and grease are removed.

As soon as the surfaces are thoroughly dried they are gone over and all of the spot-welds and gas-welds are puttied, as well as any irregularities or imperfections in the steel. A specially prepared putty is used which adheres perfectly to the bare steel.

From the puttying room the filing cases are run into an oven and baker at a low temperature for about an hour. This bake is merely to hasten the drying of the putty. As soon as the putty is hard the vertical is taken out of oven, from the opposite side to the one which it entered, and transferred to the sanding room where it is sanded by a belt sanding machine. This sanding smoothes up the puttied surface.

Immediately after sanding, the pieces are given a coat of glaze putty over the first coat of putty. The glaze putty is also a special putty; it has a very good "slip"

and produces a very uniform surface which completely hides the welding marks. The glaze is an air-dry putty, so by the time the verticals are ready for the ground coat it is thoroughly dry.

These glazed articles are sent to the paint room where they receive their first coat. This priming coat, or ground color, is applied by means of an air spray or paint gun. The vertical is placed on a turntable in the spray booth and the inside is first given its coat of paint. Care is taken to see that all parts of the interior are properly painted.

As soon as the interior is finished the exterior is sprayed with paint. Each side, the top, and bottom are gone over four times with the spray gun. They are sprayed twice horizontally and twice vertically. This assures a very uniform ground coat.

From the spray booth the cases are removed to the paint kiln, which is directly back of the booth. When the kiln has been filled the doors are closed and the heat is turned on. The kilns are of special construction. In these kilns the paint is baked at about 275 degs. F. for about two and one-half hours; then the heat is turned off and the doors are opened.

Provision is made in the kilns to have a uniform heat both at the top and the bottom so as to obtain a uniform bake. If it were not for this provision, and if a non-uniform bake was obtained, the top portion of the vertical might have been heated too much while the base and lower portion would not have had enough heat; it would be "tacky" and off color.

A light hand-sanding is next given the pieces. This is done primarily to smooth up any unevenness of the finish due to dirt which may have settled from the air, and also to form a good surface for the finish coat.

The final spray coat is now applied. It is applied in exactly the same manner as the ground coat, and it receives the same degree of bake. It differs only from the ground coat in that it is a paint that will give a very uniform shade of olive green—the standard color—in successive bakes applied at different times, in the succeeding pieces.

The oak-graining roll in operation.

After the finish coat is baked the verticals are taken to the rubbing room where they are rubbed with powdered pumice stone and water. This rubbing gives them a very pleasing satin-like appearance. They are then washed and cleaned and sent down for final assembly and inspection. The final assembly includes fitting them with drawers, bronze pulls and other bronze trim. Next comes final inspection.

All pieces are thoroughly inspected in regard to all details in the manufacture, as well as any slight imperfections in the finishing, and also for any slight variation in the color. This latter is very necessary, as in many instances these verticals are to

be lined up so as to form a battery in some office; they must all be of exactly the same shade no matter when they were manufactured.

The mahogany finish is applied in the same manner as the standard olive green except, of course, the mahogany ground color is different and a few more operations are necessary. A piece is given two coats of ground color, baked after each coat and then hand-sanded.

The pieces are now transferred to the graining room where they are given a hand brush coat of graining color, and then they are grained by hand. Expert grainers are employed and the graining on each vertical resembles the graining on every other vertical.

After graining the verticals are again baked in the oven, then they are varnished and baked again. Upon coming from the varnish baking they receive a rub, wash, polish and assembly, as do the green verticals.

The drawers of these two different colors receive a finish very similar to the verticals themselves, except that they receive a dip coat as a first coat and then a spray coat, instead of two spray coats. This dip coat is applied in a conveyor oven. The pieces are automatically dipped and baked as they slowly travel through the oven on the overhead conveyor.

The oak finish is practically identical with the mahogany finish except that the ground colors are different, and that the graining is done on a gelatine graining roll as is shown in the illustration herewith.

Each article in the all-steel line of metal office furniture receives just as careful a finish as it is possible to give it. Its quality and wearing value will last as long as the steel itself, which means a score or more of years.

Something Interesting On French Walnut.

Fully 90 per cent of the factories, engaged in manufacturing furniture and finishing it in French Walnut, are using the water stain, sizing, bleaching and many other long methods. These methods are making this finish very expensive and they are slowing up production in the finishing room. Here is something worth trying:

We make walnut furniture in both dark and light finishes. We produce the regular American Walnut and the French, or Huguenot Walnut. After the suite comes to the finishing department we select all the light burl walnut fronts for our French Walnut, and use the darker veneers for the darker finish. This eliminates the bleaching process. After this has been done we are going to finish these suites in oil stain. We give all crotch veneer a thin size of white shellac. When dry, sand and fill all veneered parts with natural filler slightly toned with a little yellow ochre and dark walnut filler to prevent the gray effect in pores. Be careful to keep all materials off the gum parts of case.

After filler has set over night stain all gum parts with stain mixed as follows: 15 pounds white lead well mixed in ½ gallon turpentine; add 2 gallons turpentine, 2 gallons stain reducer, 1 quart linseed oil, 2½ gallons of Walnut Uniforming Stain, and 1 pound yellow

ochre (ground in japan). Let this dry over night, and shellac and finish in regular way. This lead in stain will give a good foundation for finish coats, thus eliminating all filling on gum. This is a big item on some case goods which have several fancy mouldings that require a lot of time in cleaning out filler.

I would not recommend spraying this stain. It should be applied with a brush, and after the stain has begun to set it should be ragged off so as not to have a painted effect. You can get a very beautiful French Walnut if you follow this process correctly. You also get something that will not fade.—Roy L. Knall.

Surfacing and Finishing.

In the December issue of INDUSTRIAL FINISHING I wrote about the "Preparation of Wood Surface for Finish," and now I will continue the process with "surfacing." As a matter of fact, in my opinion, the whole process of finishing really consists of repeated surfacing from start to finish.

When the wood has been given a fine smooth surface in the white and is cleaned thoroughly of all dust, it is ready to be filled or shellaced or stained, depending upon what finish it is to receive.

If stain is to be used, it is generally best to apply the stain first, but there are exceptions. For instance, in the case of pine, a more pleasing color can be obtained in the final result if the wood is first given a thin coat of liquid filler or shellac, and then sanded smooth, after which a stain of oil and stain pigment may be carefully applied, followed in due time with the varnish coats.

In finishing what are generally termed soft woods—pine, poplar, gum or any close grained wood—the finisher should use filler or shellac of the best quality. I have used liquid filler which, no matter how long it was allowed to dry, would gum the sandpaper terribly. Now the manufacturer of this filler probably considered that he had a good article on account of its being more flexible than one which would dry hard and sand more easily. I differ from this idea. If the remainder of the finish is applied over a soft, gummy (or flexible if you prefer) filler, I feel sure that it will result in a checked and cracked finish, in a short time.

In the use of shellac, be sure that the film, after it is dry, is not very brittle, as this would indicate that it is adulterated with other gums. I have noticed that some of the denatured alcohol we get seems to prevent even good shellac from hardening properly. It pays to get good material for any kind of work; it will save a great deal of labor.

I do not like shellac under varnish for all kinds of work, on account of the scratches and bruises which the finished surface is likely to receive from time to time. Where the surface consists of varnish over shellac, scratches and bruises will show up more than if the finish had consisted of varnish coats over filler.

When finishing woods of the open-grain or porous type—oak, ash, walnut, mahogany, etc.—the correct filling process is quite different than for the soft woods. It is impossible to get a smooth high-grade finish on these open-

pore woods without first using a good filler. The filler for this work is known as paste filler. It is applied thickly to the wood surface, and is allowed to "set," after which it is rubbed into the open pores with the aid of tow, moss, or coarse cloth such as burlap. Paste filler is another item of the industry which can be just good or it may be extra good; the extra good should be used if possible.

After the wood has been stained (if stain is used) and is dry, it should be lightly and carefully sanded. Then fill it with paste filler, let it dry and sand again. Examine the surface carefully and if you are not sure of a good filling, fill it again. The surface is now ready for the finish coats. I must say, before going further, that in case the wood is stained before filling, a very thin coat of shellac should be put on before filling.

A coat of shellac, or good surfacing filler, may be applied after filling, to act as a sealer and help build a smooth surface. Then follow with one coat of good varnish—one that will flow on easily. When this is good and dry sand it with very fine sandpaper; clean the surface thoroughly and apply second coat. This may be rubbed, or left in a high gloss.

I believe this is a good place to stop—after two coats of varnish. More coats may cause the finished surface to check or craze.

After the wood has been properly filled as a starter, it may be finished on out with shellac if this is preferred. That is, this may be done provided the shellac is applied by an experienced workman—one who will use it thin and will sand it smooth between coats, using at least three coats, and finally rubbing with oil and fine pumice stone, or waxing.—R. E. Morrison.

Aluminum Paint Reduces Heat Absorption.

When the Bureau of Standards was asked to find a material for balloon hangar roofs that would keep them as cool as possible, experts on radiation found after several experiments that aluminum paint, applied on the under side of the roof, had the desired effect.

Having proved that aluminum paint is best for preventing radiation of heat, a multitude of other uses suggested themselves. Tests proved that when the inside of a canvas tent was coated with aluminum paint, the heat getting in from the sun was decreased 86 per cent. This keeps the tent cooi during the day, and warmer at night. Applied to automobile tops, either inside or out, the heat admitted is reduced by 60 per cent.

This is a new and interesting use for aluminum paint.—*The Oval, Du Pont.*

Most lacquers are supplied in a heavier viscosity than is practical for use and they require added thinners to reduce them to a workable viscosity.

Speed Up Work on New Plant

The McNamara Varnish Co., Detroit, is speeding work on its new eight stack modern varnish plant which will replace the old factory destroyed by fire on January 31.

The company's loss while severe was confined to the varnish plant and melting room which were destroyed. Stocks of finished material in a separate room were unharmed and though handicapped, the company is taking care of business promptly.

Modern Automobile Finishes

Control Chemist of the General Motors Research Corporation gives some interesting facts on new motor car finishes, in a recent address before the Society of Automotive Engineers at Indianapolis, Ind.

By H. C. Mougey

SEVERAL years ago our laboratory started work with the idea of securing more durable automobile finishes. In studying the work at the different automobile plants we found that each plant used a different method of finishing, but all of the systems in ordinary use may be classified according to an outline based on the properties desired in a finish. A satisfactory system must, at the least cost of labor, time and money, produce a finish that will stick to the automobile, have a smooth surface, of the proper color and be of the desired lustre. It must in addition, retain these properties for as long a time as possible.

Now, the durable color and rubbing varnishes require a long time for air drying and if an attempt is made to shorten this time by forced drying, there is a great danger of injuring the color. For this reason a material which will air dry very quickly, which can be rubbed to a smooth finish, and which is very durable, is desired.

It has been found that these results can be obtained by the use of certain cellulose nitrate materials. When these materials are applied over suitable undercoats, the solvents evaporate, leaving a film which is hard, tough and very durable. Owing to the drying of the solvents by evaporation instead of by chemical change of the materials left after the evaporation of the solvents, as in ordinary varnishes, the cellulose nitrate varnishes dry in a remarkably short time.

On the first cars on which these materials were used in production plants, the cellulose nitrate materials were used to replace the color and rubbing varnishes. They were used over surfacing coats and the lustre was produced by the use of finishing varnish as a top coat.

However, the durability of such a system is limited by the comparatively low durability of finishing varnishes. Since it was found that sufficient lustre could be produced by rubbing and polishing the cellulose nitrate materials, and since the durability of the unprotected cellulose nitrate material is many times greater than that of the most durable finishing varnish, one of the large production plants adopted in July, 1923, as its standard method of finishing, the use of a cellulose nitrate material over primer and surfacer coats, obtaining the lustre by polishing the cellulose nitrate top coat.

It appears that the change from a varnish system to a pyroxylin or cellulose nitrate system is very simple, but in reality there are a number of important factors. This is due in part to the fact that a cellulose nitrate finishing material is really quite complex, consisting in general of the following materials: Cellulose nitrate, gums, oils, softeners, stabilizers, solvents and pigments.

The cellulose nitrate formerly used in making pyroxylin finishes was a material which had one very serious fault. Only very small amounts of cellulose nitrate could be put into solution before the mixture became so thick it could not be applied. This meant that to deposit from such a solution a film of sufficient hiding power to produce the solid built-up color desired, such a great number of coats was necessary as to make the process impractical.

However, certain companies have recently discovered how to put several times the normal amount of cellulose nitrate in solution, without increasing the viscosity of the solution beyond that of the old type solutions which carry only small amounts of cellulose nitrate. The possibility of the use of cellulose nitrate enamels for finishing automobiles dates from this discovery.

There are a large number of oils and gums which may be incorporated in a pyroxylin material to obtain desired properties. To determine the kinds and amounts of these materials to use requires considerable study. The softeners and stabilizers may also be part of the solvents, but they have their own duties to perform outside of any solvent action. The solvents are materials which hold the cellulose nitrate in solution and which by their evaporation permit the film to be deposited. The character of the film is very greatly influenced by the nature of the solvents. The pigments are the colored powders to which the finishes owe their color.

The question frequently arises, "To what do pyroxylin finishes owe their great durability?" Unfortunately, all pyroxylin materials do not have great durability. Only by using the proper basic materials, combined in proper proportions, and applied in the proper manner, are we able to get this great durability.

The fundamental cause of failure of finishes is very simple and is a matter of every-day observation. Take, for example, the cracks in the surface of sugar-cookies. As baking takes place, the tops of the sugar cookies harden first. By continued baking the relative areas of the tops and the materials beneath the tops change, thus resulting in forces which crack the surfaces. This relative change can be brought about by either expansion of the lower materials or contraction of the top materials.

The familiar cracks of mud along the river banks are examples of cracks due to contraction of the top materials. In this latter case a contributing cause is the soft under-material of low strength. As the mud dries on top it shrinks, and since the soft mud beneath is too weak to hold the top material in place by adhesion, the shrinkage develops cracks.

In the case of varnish finishes the contraction, due to drying of the top coats over improperly dried under-coats, may cause cracking. In addition, on outside exposure the entire film absorbs moisture due to rain, etc., and swells, and also softens. When the sun comes out the top coat dries, and contracts, and if the material is not sufficiently elastic to withstand the stresses, cracks develop.

It is a matter of common knowledge that finishes fail much more quickly on outside exposure than when they are kept in-doors. If pianos were kept parked at the curb, and automobiles al-

ways in the corner of the parlor, the durabilities of their respective finishes would be different than at present. The factors which cause outside exposure to be so severe are largely moisture and sunlight, and by decreasing the severity of these factors durability may be increased.

The particles of pigment, which were originally used on account of their color, also have another very important effect. They shade the materials beneath them so that only the extreme top surface is exposed to the sunlight. By nature, the pyroxylin film is very much less absorbent to moisture than is the varnish film, so both the effects of moisture and sunlight are greatly reduced.

However, these elements do act on the extreme surface and eventually cause a type of failure known as chalking. This chalking is only on the extreme surface and may easily be removed by washing with a very mild abrasive, or by polishing, thus exposing a new surface which again goes through the entire cycle of changes.

Since this failure is of such a microscopic depth in the case of good cellulose nitrate finishes, the cycle of changes may be repeated many times before any serious wearing of the surface occurs. By mild polishing every few weeks, along with the ordinary cleaning of the car, the finish may be kept with an appearance as good, or in some cases, even better than it had on the showroom floor.

The new developments in materials and methods of automobile finishing have been brought about by the demand of the public for cars having more durable finishes. The results that have been obtained have come through the co-operation of the manufacturers of the finishing materials, and of the car building companies. We believe that by reason of the work which has been done and is still being done, the life of automobile finishes will be materially lengthened.

Body Finishes Seen at National Automobile Show.

The Silver Jubilee Exhibition at New York in January was distinctively a "body show". Painting was generally in subdued colors and in two shades. Grays, gray-greens, and beige or tan shades were popular; the old blacks, dark blues, greens and maroons were notable for their rarity but some of the best finished cars used them. The improved taste in the selection of colors was noteworthy; of the blatantly colored "show jobs" of a few years ago, there were only three or four examples this year.

Many pyroxylin-finished bodies were exhibited but practically all of these had been rubbed to a fair luster, or had been varnished or waxed. Manufacturers have evidently come to the conclusion that the public is not yet ready to accept the natural velvet finish of the nitro-cellulose enamel; only two were thus shown. There were plenty of jobs finished in the good old-fashioned varnish but these were generally the more expensive cars.

A new paint job that attracted much attention from the public as well as from the industry was the finish on two of the Stutz bodies built by the Robbins Body Corporation (Indianapolis).

The finish has a high luster

and is exceedingly hard—not scratched by the finger nail—and presents a mottled or wave effect in sundry colors and sizes of pattern. A gray effect on a sedan and a chrome effect on a phaeton were exhibited at the Show, but the personal preference of the writer was for a dark-blue mottled design not exhibited. The cylindrical bumpers were finished with a crystalizing lacquer and capped with nickeled end pieces. —*Autobody*, New York.

Spreading Powder With Compressed Air.

The device pictured in action herewith is the Paasche Air Brush Company's "Type P Powder Brush," designed for such work as spraying dry powders over adhesive surfaces or for light sand-blasting operations. It consists essentially of a small special container, which fastens onto the end of a regular air-

Powder brush used for satin finishing furniture, thus producing a soft, pleasing effect.

gun, and which has a protruding nozzle for discharging the powder or whatever is being sprayed.

It is used for such operations as applying bronze powder to picture frames, statuary, novelties, etc., coloring artificial flowers, and for the dull finishing of varnishes. It is effective as a small portable sand blast on operations requiring a fine stream of sand for dulling surfaces. Outside of the finishing field it is employed for spraying sugar and confectioner's powders on sweets, salt on crackers, etc.

Test Your Stains.

It is said that one of the greatest troubles in the finishing department arises from the buying of stains from any salesman that happens along, and that low price influences buying. The finisher foreman therefore gets a good many different brands of stain, and no standard stain can be adopted, of course. The result of this is that it's impossible to get uniform color results in staining.

Now, it is better to tie up to some good concern whose stains you know and like, even though they may cost a little more. I do not argue that you should never try others' stains. In other words, I don't recommend that you tie yourself so tight that you may miss a possible good thing.

Every large user of stains should have the means for testing the stains that it uses, or thinks of trying out. The stain testing would pay for itself in course of time.—A. K. A.

There is considerable satisfaction and comfort in referring technical matters of vital concern to men who know the correct solution of your finishing problems.

Wm. E. Spruance Dies

William E. Spruance, president of the Gilbert-Spruance Co., Philadelphia, died Saturday, December 27, at his winter home in Orlando, Fla.

Mr. Spruance, who was fifty-five, had been the head of the Gilbert-Spruance Co. for about ten years.

Modern Drawer Finishes

An authority on finishes and modern finishing room practice submits twelve different methods of finishing drawer interiors, and suggests relative advantages and disadvantages of each

By H. J. Turleman

AFTER listening to accounts of various ingenious methods used in the cabinet trade to make soft woods look like "what they ain't," a young varnish salesman asked a veteran finisher how he could tell a quality finished piece of furniture when he met it. "Look at the finish in drawers," was the brief reply.

With this injunction ringing in his ears, the salesman, who had never hitherto given much thought to anything so obscure as a drawer finish, decided to make some inquiries as he made his rounds. The results are interesting, if only to show how little standardized this particular operation has become in comparison with that for the rest of the piece.

Before listing the different methods with attendant advantages and disadvantages, it may be well to mention just why a drawer finish is, or to put it another way, what is expected of it. The woods commonly used are birch, gum, basswood, mahogany, and walnut, according to the quality of the furniture. Any of these, if left in the white, will soil and finger-mark, or perhaps warp in contact with moisture.

Thus the first essential of a drawer finish is to seal the wood and render it possible for the housekeeper to dust and clean it readily, without in time producing a splotched or dingy interior. As wet objects have to be taken into consideration, the finish also must be waterproof, and if any coloring matter is introduced into the finish it must be of such a nature that it will not readily come off.

1. *Shellac.* One coat of the pure article, 3 to 4½-lb. cut, is widely used partly as a matter of tradition, partly because it drys quickly and thus requires little care, skill or thought. If the wood is rough, two coats are sprayed, but in either case such a finish is instantly marred on contact with moisture.

2. *Shellac substitute.* Also widely used on account of the saving as against pure shellac. A few are waterproof but most of them are not, and as a consequence the chief argument is economy. When tinted with anilines there is danger of color coming off on contact with moisture, as most of the spirit anilines are at least partially soluble in water.

3. *Shellac, Substitute or Varnish and Wax.* One coat of each is a popular drawer finish, as the wax offers a surface easy to keep clean and is more agreeable in lustre and to the touch than either No. 1 or No. 2 by themselves. The wax may be tinted—see below.

4. *Wax.* Used alone, it is a purely temporary proposition. The customary procedure is to melt it, thin down with gasoline,

and in many cases to tint it with color in oil to harmonize with the exterior oak, walnut or mahogany shade. Heat or contact with anything oily or greasy will soften the wax and, in the case of clothing, cause the color to come off—a serious drawback. If wax alone is applied, the wood must be sanded to extra smoothness.

5. *Varnish Leavings.* Sometimes the drippings and skins of varnish are worked over with benzine into a slush coat that answers as a drawer finish on very cheap work. A coarse finish produces an uneven gloss and, unless it is more than ordinarily well strained, it gives a speckled one as well. An economy job pure and simple.

6. *Flat Varnish.* Very popular with the better class of furniture, and usually applied over a first coat of shellac, shellac substitute or clear varnish. Possesses much of the merit of wax with none of the drawbacks, though naturally more expensive both in first cost and slowness of drying as compared to any of the above.

7. *Oil.* This is a method often employed, as follows: Apply two thin coats of shellac or shellac substitute; sand and oil off with a rag saturated in paraffin oil. This is quick, inexpensive and possesses an agreeable lustre akin to wax, but it is not durable and may be affected by heat.

8. *Drawer Varnish.* There are a number of brands bearing this name which for the most part are either flat varnishes or shellac substitutes. Some are waterproof some may be obtained tinted, and some dry more quickly than others. In price they vary considerably.

9. *Coach Varnish.* As such a finish may be obtained for as cheap as 90 cents a gallon, it offers advantages in economy and possibly as an undercoat for wax or flat varnish. It is not recommended for use on soft woods and nowhere yields what can be termed a uniformly agreeable lustre. It is sometimes tinted to a neutral color by the addition of asphaltum varnish.

10. *Rubbing Varnish.* When employed as drawer finish, only a light rub is given—just enough to knock off the gloss. As an undercoat, shellac or shellac substitute is used, and if a tinted effect is required the wood is first given a weak application of the stain used on the interior. Naturally this system is the most expensive of all considered, because of the numerous operations and the slowness.

11. *Lacquer.* With the increase in popularity of nitrocellulose lacquers, it would seem natural for this to grow into use as a drawer finish. Waterproof, quick drying, tight sealing, it possesses an odor, however, that is liable to permeate clothing, and it would certainly spoil any food. Until this objection is overcome, it is not likely that lacquer will prove a popular finish for closed interiors.

12. *Special Lacquers.* Where the objection of odor is not a consideration, it is possible to secure an excellent drawer finish through the use of tinted lacquers, lacquer enamels (for painted furniture) and flat lacquers. These last provide a very agreeable lustre, but should be applied over at least one coat of gloss in order to give depth. Flat lacquers may be tinted in all wood shades to harmonize with exteriors.

Washed Air for Ventilation and Varnish Drying.

The proper treatment of the air in industrial plants has become the subject of increasing study in manufacturing departments handling specialized products. In the finishing departments of large manufacturing plants, most attention has been given to the problem of providing an atmosphere of just the right temperature, moisture content and cleanliness. The first step, years ago, was to pass the air through waterfalls or force it under the surface of a body of water and let it bubble up.

A great improvement was made when the air was passed through a chamber in which were placed a number of spray heads for "atomizing" the water. A much more intimate contact between the air and water was secured and the cleansing action much improved. One of the difficulties of this system, however, was the necessary upkeep of the spray heads.

Later, another type of air washer which is much simpler, eliminating the necessity for the pressure pump, spray heads and screens, and reducing the power requirements and upkeep. This air washer uses wabble wheels instead of the delicately adjusted spray heads. These wheels have a periphery somewhat like that of a circular saw but with the teeth bent over and the hub bored slightly out of line so that when the wheels emerge from the water bath in the bottom of the chamber, the spray is not thrown in a single plane but scatters sufficiently to fill the chamber space for which the installation has been designed. The wheels revolve approximately 1,000 R.P.M., varying of course with the diameter of the wheel. The wheels are only partly immersed in the water in the bottom of the chamber, the water level being kept constant by a float valve.

Grease After Polishing.

Renovators or polishes containing an oil are very apt to leave a greasy film unless removed at the time. The best remover that I know of is strong vinegar or acetic acid diluted to the strength of good vinegar. Also finger marks left on finished article, like piano for instance. Alcohol is excellent also, but rather dangerous in unskilled hands, as it readily affects the varnish. A cloth slightly dampened with alcohol and quickly and deftly passed over the surface will remove every vestige of grease. This is the method of piano finishers, after hand-rubbing with oil and lampblack or rottenstone powder.—R. T. Leming.

Popular Finishes for Red Gum.

During the past few years there has been a steadily growing tendency, on the part of American furniture manufacturers and interior decorators, to make use of our own beautiful cabinet woods, instead of importing so much high-priced walnut and mahogany. The reason for this is apparent. We have a number of beautiful cabinet woods that are equally as suitable for fine furniture as the foreign kinds, and they are cheap enough to be used as solid pieces with a consequent stability and freedom from the trouble and expense of veneering.

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No. 400 Paste Wood Fillers do not become mushy in the bottom of the pores, shrink, turn gray, or cut up when used under lacquer, but dry to a hard surface to which the lacquer naturally adheres.

All standard shades are represented in the No. 400 Paste Wood Filler Line and only the most carefully selected colors as to non-fading and permanency are used in manufacturing them.

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3—Has unusual body and fullness on the work.
4—It's tenacious—knits perfectly to the surface.
5—Will not chip, peel, crack, or check even when exposed to sudden changes in temperature.
6—Not affected by live steam, ice, or hot dishes.
7—The ordinary scuffs and abuses of every-day use have little or no effect on this finish.
8—It is light in color—eliminates greenish cast.
9—Absolutely waterproof—readily washable.
10—Dries rapidly, insuring greatest production.
11—Can be dull rubbed or highly polished.
12—Has a full rich tone that enhances the natural beauty of the wood.

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National Headquarters
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Walter K. Schmidt, Pres. Bert A. Way, Vice Pres. Elmer F. Way, Sec'y. Treas.

GRAND RAPIDS, MICHIGAN

The most popular of our native cabinet woods is red gum, the best of which is cut in the famous St. Francis River Basin in Arkansas. It is a reddish brown wood, exquisitely figured with darker colored markings. When properly finished, it rivals in appearance the finest mahogany or walnut, only an expert being able to detect the difference.

The most popular finishes for red gum are natural, walnut, dark red mahogany and brown mahogany.

The natural finish is most popular with interior decorators, and it is easily applied as follows: Surface and sand the wood thoroughly; then put on a coat of hot, boiled linseed oil, rubbing it in vigorously across the grain and using a soft cloth for the purpose. This serves a threefold purpose. The oil acts as a filler and a preservative, and it enhances to a great degree the natural beauty of the wood, by deepening the color. Apply over this, a coat of white shellac—about a 3-lb. cut. When this has dried, rub thoroughly with fine steel wool or sandpaper. The shellac will have stiffened any particles of wood grain that might have been raised, and the rubbing quickly removes them.

Follow this treatment with a coat of white shellac, 4½-lb. cut. Rub this to a smooth level surface and finish off with one or more coats of fine cabinet varnish, as the job requires. The last coat should be rubbed with fine pumice stone and oil. A fine natural finish will result, and it will hold its appearance for years.

For walnut or red or brown mahogany the procedure is much the same. Prepare the wood by successive spongings with warm water, drying and sanding until the grain will not rise any more. When mixing stain, have the water boiling hot and add a little of the powder at a time, stirring thoroughly until the powder is completely dissolved. Try the stain on test panels until you obtain the desired shade. Then apply to the surface to be finished and allow it to dry. Brush on a coat of white shellac (3-lb. cut) as above, and sand off the stiffened slivers with fine sandpaper. One more coat of shellac (4-lb. cut) well rubbed with steel wool, makes the job ready for the varnish. The dull rub is the most desirable, and dull varnishes are preferable. Any number of coats may be applied, the more the better. Rub finally with fine pumice and oil, and you will have a splendid dull-gloss finish that will never crack, check, or curl, and it can be renewed by merely wiping the surface with a soft cloth.—Theo. R. Wright.

Fine Cracks on Mahogany.

Mahogany finish often shows very fine cracks or fissures which mar the appearance of the object seriously, but they may be removed from sight by rubbing into them a putty made by mixing together dry powdered Venetian red and gum Arabic mucilage. By making the color to suit, this form of putty may be used on other woods.—S. W. Rathfield.

Spring 1925 Catalog Ready.

The G. J. Liebich Co. (San-Itai-Rie Filler Co. Division) announces that its 1925 spring catalog is now ready. All finishers and other users of lacquers, varnishes, shellacs, fillers, etc., will be interested in the commodities described by the catalog. A free copy may be had by writing to the G. J. Liebich Company, 164-170 W. Kinzie St., Chicago, Ill.

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Industrial Finishing

PRACTICAL PUBLICATIONS, Inc.
Publishers.
210 Holliday Building
Indianapolis, Ind.

Issued monthly. Distributed exclusively to executives and foremen finishers in all kinds of industrial plants where finish coats are applied.

MARCH, 1925

Future Industrial Prosperity

There are plenty of indications that the American people—the buyers of industrial products—are enjoying prosperity, and that their purchasing power will permit them to continue to indulge in the pleasure of buying automobiles, fine furniture and other such products which were once looked upon as luxuries, but which are now more in the nature of necessities of the modern standard of living. The hundred largest banks in the United States showed an increase in aggregate deposits of nearly $2,500,000,000 in the past year, and on December 31, 1924, these banks reported total deposits of $15,149,380,913. The latter sum is said to represent but one-third of the total bank deposits of the entire country.

The National City Bank of New York, in a recent letter, said in part:

"As for the danger of getting all the work done up, so that there will be no more to do, the Delaware & Hudson Co. last month entertained a distinguished company of guests to show a newly-completed locomotive, said to possess about double the efficiency of any locomotive previously built. If this is true, it would appear that the buying of that class of railroad equipment is about to begin all over again, and something like that is occurring all the time all over the industrial field. The improvements in industry are constantly making it over, and never so rapidly as now.

"As for houses, a little falling off in the demand for new ones might lower costs, with benefits so important as to fully compensate for a temporary slackening of activity in that quarter. The automobile industry has passed a great many imaginary saturation points, and even if a real one has been reached we are not prepared to believe that this is ominous of industrial depression. There are not a few people who think it would have been better for other industries if the saturation point for automobiles had been reached lower down, but that is an abstract question which we have never thought it worth while to discuss."

Finisher Foremanship

Every foreman finisher has his own ideas about foremanship, but perhaps the question sometimes arises in his mind, "am I devoting my time, my knowledge and my ability to the best advantage, considering my obligations to the men under my supervision, and to my employer?" If this question doesn't occur to the foreman he is losing sight of a valuable guiding light. He himself, and the work of his department, are judged by more interested people than he ever suspects.

Foremanship differs vastly from skilled workmanship. In

the first place foremanship involves responsibility for the departmental output, both in quantity and quality; also for the cost of production, cost of maintenance, and for the performance and morale of all the workmen. It's the foreman's job to get things done rather than do things himself. The more men a foreman-finisher has under him the less actual finishing he should set out to do himself. This applies even to some of the experimenting, which occupies so much of the time of many foremen finishers.

The foreman will do well to devote more time to supervision and inspection, directed to the end that every man is not only busy, but that he is working correctly and efficiently; that every workman is not only busy now, but that something more is coming along to keep him occupied; also that all mechanical equipment is performing satisfactorily. A lot of other things need attention in the way of supervision, if the department as a whole is to make the showing it should make.

Witness, for example, the spectacle of a finishing room where a dozen or more finishers are working at low productive effort, some entertaining one another with light talk; some puttering along with little interest while supposedly fixing a part of the mechanical equipment; others half-heartedly preparing to start some operation, or putting things away after the completion of a job—all this going on while the foreman is in one corner or in another room, directing all his attention and effort toward personally doing some piece of work which he feels demands the highest skill and the greatest care. This shows poor foremanship.

The personal satisfaction the foreman gets out of performing a particularly good piece of work, costs the company a lot of money. That foreman is at fault in not hiring or developing men who can do the most particular work in his department, and even do some if not all of the experimenting with new materials at his direction. The expert finisher who as a foreman cannot be weaned of this compelling desire to do a lot of particular work himself, to the exclusion of everything else, should never be entrusted with the responsibility of looking after a crew of finishers and directing productive operations in a finishing department.

Interest in Mahogany

There is some evidence in the furniture industry that mahogany soon will come into more general use again as a furniture wood. Mahogany is a wood of beauty both in richness of color and grain. In finishing it no improvement is ever made through the use of shades or tones of color that stray far from the color that nature put into it.

It is interesting to note that with the renewed interest in mahogany by some furniture manufacturers, there has been developed a "new" and pleasing shade of color for the latest mahogany finish. It is a shade that typifies the true mahogany—one that completely harmonizes with the distinctive grain and rich color of real mahogany. It is neither too light nor too dark; not too red nor too brown, and the finish may be either varnish or lacquer.

The new mahogany shade in modern finishes has been named

"Claremount" and many who have seen it declare that if modern wood finishes are ever standardized as to shade of color, this one will be chosen as the standard mahogany finish.

Furniture Finishing.

This form of finish is divided into three kinds, namely, the flowed-on or gloss finish, the rubbed finish, and the polished finish. These three classes of finish relate to the best class of work only.

In the gloss finish the wood is bodied up with paste filler and varnish, and a surface as smooth and level as plate glass is sought. The rubbing is done with powdered pumicestone and water; oil rubbing is not employed on this class of work, as it would not give the proper surface for a high gloss finish. The varnish is flowed on and is allowed to stand until dry.

For the rubbed finish there are several methods employed. One way is to apply several coats of varnish after the filling, with time for each coat to dry, and each coat being rubbed with powdered pumicestone and oil to remove the gloss, and finally to form a surface. The finer the pumicestone powder the finer the finish, which will be dead or without lustre.

The polished finish has the surface prepared as described in the gloss finish process, and then is rubbed with the finest pumicestone powder and water, for water cuts faster than oil and is easier to clean up. When oil is used grit gets into corners and crevices and is very difficult to remove. Not so with water. After rubbing and cleaning-up, the surface is rubbed with powdered rottenstone and water, which removes the fine scratches made by the pumicstone rubbing.

It is customary in the best finishing rooms to take some polish and waste and rub the surface briskly, which causes a slight polish to appear. Then a large piece of muslin is dampened with water and a little alcohol sprinkled thereon, with which the finish is "spirited off." This removes every particle of cloudiness that ensues from the polish. This sort of polishing is done on the finest grade furniture, pianos, etc. A little polish is placed on the palm of the hand and is rubbed over the surface with a circular motion. Some experience is needed to do this well, and then it will efface every mark left by former rubbings.—C. E. Matthews.

Protecting Wax Finish.

Dampness seriously affects wax finish, and while the damage is easily remedied, yet it is more economical to prevent than to cure. A protective surface coating may be made as follows: Mix together six parts of copal varnish, six parts of boiled linseed oil, and ten parts of turpentine, all by weight. Zanzibar copal varnish is best, but ordinary copal does very well. This coating will preserve the wax finish against water, and will not alter the appearance of the finish.—P. A. Molloy.

Paasche Opens Offices in Detroit

The Paasche Air Brush Co., Chicago, held its annual sales convention during the week of January 5.

Announcement was made of the opening of a Detroit office in the General Motors Bldg., with E. H. Janes in charge.

Period Finishes—Jacobean

How and when the original Jacobean style in furniture started, and what methods are employed to produce correct finishes and high-lighting on modern Jacobean designs in fine furniture

By R. J. Meade

IN 1603 English sovereignty was transferred from the house of Tudor to the house of Stuart in the person of James I of Scotland. The Latin of James is "Jacobus", and the term Jacobean is applied to furniture developed in England under a succession of rulers including the dictator Cromwell and the restored Charles II, up to the advent of William and Mary in 1689.

Jacobean-Cromwellian oak sideboard.

The squat character of the furniture may be attributed to the low ceilings then the prevailing architectural style. Solid and cumbersome lines were relieved by flat carving in lozenge, diamond, and other geometrical forms, with heavy turned legs and block or ball feet joined by solid stretchers. With the Restoration, however, furniture took a turn for the gayer, walnut displacing oak, scrolled stretchers replacing straight, and spiral legs in place of square.

In this era cupboards for the first time received drawers, and cabinets were first set on high legs, the fronts often lacquered or decorated with inlay or marquetry. Up to the Restoration chairs had straight, squarish backs which were either caned, railed, flat carved or upholstered. Heavy tables carried over the Tudor bulbous legs, and lighter ones were three cornered, gate-leg and slide top. After that chair backs were higher and furniture in general tended to follow French styles.

Jacobean is the first period to show an influence on what we call Colonial furniture, early settlers bringing over numbers of pieces which were then copied on the soil of New England. Modern Jacobean runs largely to dining room suites together with odd chairs, gate-leg tables and cupboards. Restoration reproductions are popular for living room chairs, desks and stools, also day beds and chests of drawers. Cromwellian is occasionally met with in oak and walnut bedroom suites with geometrical panel sections and coarse beading. The finish treatment is based on the wood and follows closely these lines:

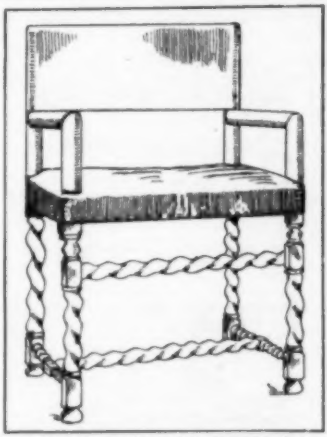
Modern Oak: An oil stain is customarily used of a standard shade obtainable in ready mixed form from any manufacturer, under the name of Jacobean. It is laid off in even strokes and then wiped off to insure clearness of tone, but uniformly and not here and there as for high-lighting. No filler is used as this period still calls for an open-pore effect. The protective finish may consist of shellac, or lacquer and wax, or flat varnish, or flat lacquer.

Antique Oak: Occasionally separate pieces, such as stools or living room chairs with wainscot backs, are turned out in a finish which is designed to approach the appearance of originals. In such a case the same stain is used, but raised parts are high-lighted, and the recesses of carvings are antiqued with a glaze made up of three parts Van Dyke brown and one part fine lamp black in oil thinned to liquid consistency with turpentine. This is wiped on over stain and a wash coat of shellac, then protected as above indicated.

Walnut: Water Stain may be used, made up of from 4 to 6 oz. of walnut crystals to the gallon of water, or an oil stain of the same shade as standard American or slightly darker. Filler is optional, but when used it should be of a chocolate brown shade. The protective finish may consist of shellac and two coats of rubbing varnish or three coats medium body lacquer, both rubbed quite dull.

Caning: This is usually antiqued in some way, either with thin asphaltum protected by flat varnish or for speedier work, with shellac colored with brown spirit stain dissolved in denatured alcohol. The first may be high-lighted with a muslin pad while the asphaltum is still wet; the latter allowed to dry and then wiped off here and there with a rag soaked in alcohol.

High-lighting is carried out wherever friction of the body would naturally bring about wear. As even unexperienced eyes are offended by improperly-placed high lights it is well, in case of doubt, to study this well in advance of the work. As it is possible to sit in a chair or at a table, the problem is comparatively easy, but not so much so with cabinet work. Wherever the hand, foot, elbow or body is likely to touch most often is where high-lighting should take place.



Charles II armchair of Jacobean period.

On oil stain the work is done with a rag while the stain is still wet; on water stain with fine sandpaper after the stain is dry. In both cases a careful hand and eye is needed to blend gently from light to dark so as to avoid going down to the bare white wood, or making an abrupt change of shade approaching a

two-tone effect. This latter is purely ornamental and has nothing to do with the effect of antique wear.

Care of Finish Drying Ovens.

The painstaking care of many operators is often neutralized when unclean work results about the finishing operations. One large plant in Brooklyn, N. Y., producing small metal specialties, had been having considerable trouble for a time. Much of the annoyance was caused by the dusty atmosphere right near the drying ovens, the large heating contrivances themselves, however, being accountable in part. It was decided to install new ovens, and better care was to be taken. The action to date has proved profitable.

The procedure now is to clean the ovens at least twice a week, depending upon the amount of work that has been done. The foreman of the finishing department discountenanced the painting of the interior of an oven, pointing out that eventually the coating would flake, and flakes would drop and adhere to the work.

An unclean, dusty oven is the reason much of the work often contains particles, however minute these be. Giving a brisk cleaning to the entire interior of the oven, which includes all the fixtures that too often are given but lax cleaning, will usually insure improved work. Racks, rods and hooks and corners should be thoroughly cleaned, using benzine or turpentine on rag to remove hardened scale. By spraying simply with water, then turning on heat for about half an hour, a cleaner oven will be the result.

Dust and other particles can be speedily removed by using a vacuum cleaner, this making for a thorough job. In conjunction with this cleaning, care should be taken by the operators to keep down the dust as much as possible. Opening and closing the doors hurriedly, it was pointed out, tends materially to contribute to specked work.

Particularly dusty operations, such as the application of asphaltum powder on printed-edged plates, is one outstanding reason why bad work attends at the finishing operations. Avoiding drafts, especially while finishing is being done, will reduce poor work at that operation. All paraphernalia about the finishing operations should be as free of dust as possible under the working conditions. Periodical attention to this matter will insure a better grade of work. The added care exercised will have its effect on the workmen, who should turn out better workmanship.

When the work must be conveyed at too great a distance to the ovens, this is another reason why there are "stipplings" and specks on work coming therefrom. The shorter the distance to the ovens, the better work will be processed. Sometimes spraying is done under very trying conditions, thus hampering the operator; then the best oven cannot make for high-grade work. When working conditions are excellent, both in the interests of the operators and the product, the finished work will measure up much better, and there will be few complaints because of spotted and flecked articles.

It has been found that an oven supposedly "too expensive" is often the more cheaper one in the long run. It is a matter of taking proper care of the oven. Small plants sometimes will do well when they make their own ovens, but this procedure calls for an art peculiarly its own. It should not be a shaky contraption which will only hinder operators. Here plans must be in accordance with Health Department regulations. Ventilation of ovens must be right and unobjectionable from a working standpoint and from people living in the vicinity. Ovens should also have a uniform heat distribution to make for good work.—Frank V. Faulhaber.

A Refinish Job On Interior Woodwork.

Some time ago I took the job of refinishing the interior woodwork in a county court house in Arkansas. The woodwork, floor and all were plain or slab-sawed oak, and it had been finished in natural color. It had been finished the first time with a flat finish; instead of a rub finish it had a coat of flat varnish over the varnish used. Now, they wanted it done in fumed oak.

Before I took the job another man had been called in to try it. He started in by putting a varnish stain over the old finish. I told them they would have no success with such a job, as the finish would never dry properly and the varnish stain would crawl; it would not leave the grain of the wood show through, either. This man did one room and they stopped him because his varnish stain crawled and would not dry. It was applied over the dull finish which contained more or less paraffin wax. The flat varnish that had been previously used was probably an ordinary varnish to which paraffin oil, or paraffin wax dissolved in turpentine, had been added.

Turpentine or benzine, used as a thorough wash for the surface before attempting to varnish, will prevent crawling, but it will not help show the grain of the wood. To apply a varnish stain over woodwork, finished like that just described, is like painting the second coat over the first. After the first, or primer coat is on, you can see the grain, but after the application of a second coat, it is gone; the same principle applies in both cases. A light rubbing, with fine emery paper or steel wool before or after the turpentine wash, would help considerably.

I removed all the old varnish and sanded the surface of the wood. I used the following to remove the varnish: Melt 1-lb. of home-made lye soap by heat, add 1-pt. of water, and pour this into a 1-gal. can. Add ½-gal. of varnish remover; pour in wheat flour and mix to form a thin paste—one that is just thick enough to stay where you put it. Apply to the surface and leave stand until it has loosened the varnish; scrape off with putty knife or steel scraper.

I made my own stain filler, which for a refinish job like this need not be much of a filler. I used the following: 2-lbs. burnt umber, ½-lb. burnt sienna, 1-qt. linseed oil and 3-qts. pure turpentine. Mix thoroughly, apply with a brush and leave stand 10 or 15 minutes; then wipe off with a clean rag in order to remove as much oil as possible, because the oil will require quite a while to dry and, if left on, will delay you in applying

the varnish coats. I used pure shellac for my next coat and rubbed it down with No. 00 sandpaper.

Then I varnished the surface with three coats of high-grade floor varnish, rubbing each coat down with pumice stone and oil. The last coat I polished with powdered rotten-stone. One must use a good felt for this. The felt pads must be kept clean by washing them at intervals in gasoline and hanging them up in the open, so the gasoline will evaporate and so they will dry thoroughly. When my job of refinishing was completed it looked fine and everyone concerned was well satisfied with it.—J. W. Crout.

What Do You Know About Lacquer?

This is a question that we who are calling on the manufacturers today are often asked. We come back with the question, "how are you using it?" A great many times I have found that it was only a waste of time and money for a manufacturer to try to use it the way he was, and get good results.

My experience is that the best results are obtained by using a water stain, because if lacquer is used over an oil or spirit stain, the solvent will have a tendency to cut through the lacquer, producing a muddy appearance. When lacquer is used over a water stain it makes a preservative finish and will protect the stain from the air thus insuring a permanency of color.

Lacquer also protects veneered parts from water, and it gives a flat invisible finish. It can also be rubbed or waxed if a polish is wanted, but look out as to the thinner that is being used. Often we see a grayish cast and it turns white, but if the lacquer is what it should be, this will not occur.

Never look for good results with a cheap lacquer. Any man who uses the best he can buy will find it cheaper in the end. A good grade of lacquer is made on a cellulose base combined with powerful solvents which hold the cellulose in solution. In conclusion let me warn the finisher never to use alcohol as a thinner for lacquer, because it will cause precipitation and it breaks down the lacquer.—G. E. Moran.

Finish for Golf Balls.

Having seen a formula given in a paint trade publication for painting golf balls, advising ordinary white lead and zinc white paint mixed with linseed oil and turpentine, I offer here the better way. Take one part of dry pulverized white shellac, two parts of denatured alcohol, and one part of dry powdered lithopone, all by weight. Mix shellac and lithopone together and place in a glass vessel; a bottle will do. Add alcohol and shake together, shaking occasionally until shellac is dissolved.—Kamud.

Continued and complete turnover is the key to profits in business.

Let us hold our heads up higher and take greater pride in the business we are engaged in.

Slight Change in Name

Zapon Co., of Wilmington, Del., discontinued on Jan. 1, 1925, the use of the names of the Celluloid Zapon Co. and the Zapon Leather Cloth Co., which will hereafter be known respectively as the lacquer division and the leather-cloth division of the Zapon Company.

Overcoming Spray Troubles

Calling attention to the causes of many so-called spray troubles, this foreman finisher gives specific instances from experience, and reveals some interesting facts on the prevention and remedy of such troubles as may occur in any finishing room

By L. J. Goudin

FINISHERS, who use the spray for applying finishing material, occasionally have some kind of trouble which they at once proceed to blame on the machine. Sometime ago a concern had trouble with white specks showing beneath the varnish on their walnut and mahogany goods. Someone told the manager that the spray was the cause of the white specks; he gave orders to stop spraying shellac, and go back to the brush.

The fact that the spray had been used for some considerable time with entire satisfaction never entered into the manager's calculations. Had he stopped to give the matter the consideration it deserved, he would have reasoned that if the spray could do satisfactory work for several months there should be no good reason why it could not continue to do so if properly handled. Further, he would have reasoned that the cause of the trouble was not in the spray so much as in the manner of using it.

Here are the facts: The spray was put in sometime during the early winter and it gave entire satisfaction until sometime during the summer, at which time the trouble with white specks developed. As everyone knows, the air at all times of the year contains a certain amount of moisture—more during the warm summer weather than during cold weather. The reason for this condition is twofold. In the first place, during warm weather there is greater evaporation of moisture from rivers and lakes than there is during cold weather. In the second place, warm air will carry in suspension a greater amount of moisture than will cold air.

Attached to each spraying outfit is a condenser for condensing the moist vapors to liquid form, and eliminating them from the air before the latter comes in contact with the shellac, or whatever is being sprayed. This condenser has to be emptied at intervals. Otherwise the condensed vapors will be carried along with the shellac, or varnish, and cause trouble. In the case of shellac it will cause little white specks. If the condenser is full of water the spray acts as an atomizer, and instead of the moisture going through in the form of vapor (as it would if there were no condenser attached) the vapors are first condensed, then atomized; in this condition it is carried along with the shellac.

It is small atoms of water that cause the white specks in the shellac, for as most people know, water will cause shellac to turn white when the two come in contact. The obvious remedy for the trouble here mentioned is greater attention to the condenser, especially during warm weather, and more especially when the air is

"clammy". The hot, "clammy" period, which preceeds and foretells a coming storm, is particularly trying, and unless the condenser is watched closely and emptied frequently it is apt to become too full to do its work properly. The fact that it fills rapidly under such conditions is an evidence of its reliability, for were it not doing its work as it ought the moisture would remain in the air instead of being condensed and left in the condenser.

Every person cannot operate a spray successfully, but this is not anything unusual, as every person cannot become an expert with the brush. Every finishing room that employs many men has one or more men who merely "get by" with their work in the varnish room. One cannot help the thought that these men have missed their calling, and that they might have been expert at something else.

Typical scene in furniture finishing room.

It is very important that the spray operator be specially qualified for his work. The writer has given a great deal of careful thought to this matter and, after considerable experience along this line, has reached the conclusion that comparatively few experienced brush-hands can become expert spray-men. One reason for this is that as a rule, they are prejudiced against the spray. No man can work successfully against his natural or acquired bent of mind.

To make a success of the spray the operator must enter upon his work with enthusiasm. He must believe that the spray can be a success, and that he is one of the men who can make it a success. Any man of average intelligence, whether or not he has had any experience with varnish, can learn to operate the spray successfully if he has faith in himself; but the man who has to overcome both his own prejudice and the difficulties of the work is not likely to succeed.

The most successful varnish spray-man I have yet met, was a youth of not more than sixteen summers. The shop in which he was employed had been having considerable difficulty getting good work from the spray, but the foreman was determined to make it a success. After trying several brush-hands with indifferent success the foreman was approached by this youth with a proposition to give him a trial. The enthusiasm of the boy was inspiring and the foreman decided to give him a trial. When passing through the shop one day I saw this boy operating a spray. I examined some of the work which he had done on the previous day; and it was perfection.

The difficulty with most varnish brush-hands when they come to operate a spray is that they have much to "unlearn", as well as much to learn. Of course their knowledge of varnish will be of assistance to them if they can make up their minds that the spray is here to stay, and that it is up to them to help make it a success or they will be forced out

of the business. Of course, in that case there is compulsion rather than a natural liking for the work. My experience and observation convinces me that the spray can best be operated by young men who have no prejudices to combat. However, some of the older men can succeed at it if they will.

Shellac is a good liquid to learn with, for it is easier to apply without sagging. After one becomes accustomed to shellac he can soon learn to apply varnish. There is no better way to apply shellac than with the spray. The shellac goes on more uniformly, and sandpapers more easily than when applied with a brush. Similar difficulties, encountered with the spray during humid weather, are frequently encountered when the shellac is applied with a brush. Alcohol, which is the usual solvent in shellac, has an affinity for water, and if the humidity is very high the shellac will be affected, more or less, no matter how it is applied.

With orange shellac the first noticeable effect of a high humidity is the change in color, the shellac taking on a pale greenish hue, and becoming quite opaque. Gradually it becomes transparent again as it dries. Bleached shellac also becomes opaque in a high humidity, and gives a cloudy appearance to dark woods such as walnut and mahogany. A properly operated spray has an advantage over the brush under conditions of high humidity because the condenser removes the moisture from the air which first comes in contact with the shellac. This dry air helps in setting the shellac before it can take up moisture from the air.

When one has trouble with any finish applied with a spray, he will do well to remember that all the larger and better shops are now applying finishes of all kinds in this way. The solution of the problems which arise are to be found in getting the right kind of a man to operate the spray, rather than in a return to the brush. Of course, one must not expect the operator to do the impossible. He cannot reasonably be expected to do good work in a low temperature, nor with cold liquids.

Many of the earlier failures with this method of applying finishes resulted from trying to do the work in a cold room. It is only within quite recent years that the importance of heat in this respect has been fully appreciated. Some of the latest appliances have electric heaters attached to the air line. These heaters raise the temperature of the air, and then the warm air raises the temperature of the material when the two unite.

Another matter that requires very careful consideration is the amount of air pressure under which the spray, or air brush, is operated. I will not try to give specific instructions here regarding this matter, but rather refer the operator to instructions furnished by the manufacturer of the equipment. My purpose here has been served when I direct attention to its importance, because many failures have resulted from inattention to this matter.

In conclusion, I would say that if your first experience with this method of applying finishing material does not come up to your highest expectations, do not at once condemn the equipment. Take the matter up with the manufacturer, or call in someone who understands the method thoroughly.

Questions and Answers

This service department is conducted to meet the readers' need for prompt information on specific problems, and to give others an opportunity to review the questions and to offer comments, suggestions or answers

What Finish Should Be Used for Tumbling Handles?

Will someone please give us information regarding the process of tumbling small handles so as to get this tumbled finish? We know about constructing the tumbler, but we are not quite sure about what material to put into the tumbler, or what to use along with the parts we want to tumble in order to get the best finish. We understand by placing small wooden parts along with these that we possibly would get better results.—C. H. & T. C.

Can Chairs Be Stained and Filled By Dipping?

We are bed and furniture manufacturers and are finishing a new factory for the manufacture of a cheap grade of chairs. Since the output is going to be quite big we would like to use a rapid and economic way of finishing and think that may be you could give us a method of finishing by dipping. Please tell us if we can dip and stain the chairs with oil or water stain, if the filler can be applied by dipping, too, etc.—Salinas y Rocha, Monterrey, N. L., Mexico.

How to Remove Printing From Sheet Metal.

In looking through Feb. issue of Industrial Finishing, I notice a question by S. Pump & Equipment Co., asking how to prevent stains from coming through when lacquer is put on sheets of iron printed at factory with sizes on them. I suggest sanding this print down smooth, then giving it a thin coat of aluminum bronze paint. The trouble will be settled I think, with a good uniform job as the result.

Another scheme is to give it a coat of white shellac. Possibly a coat of lime whitewash over this print will help.

Here is another idea: size the spot where print is, with coat of white shellac and when nearly dry rub on dry aluminum bronze with soft rag or cotton. I think this is a good method. It seems to me that the print put on the sheet iron penetrates the chemical film on surface, and shows up a contrast. This has come under my observation also, for many years, but I never gave it serious consideration before. — Henry Schubert.

Varnish Sweating Again.

In reading an article in Feb. issue of Industrial Finishing, I notice an article in which Mr. W. G. Campbell described the cause of varnish sweating. I must say that I do not agree with him as to cause, which he lays entirely to the undercoats not being properly dried. Further on in this article he states: "As a matter of fact any brand of rubbing varnish will sweat out after you rub it, if what it is applied over, is not dry."

I believe any rubbing varnish will sweat if it is rubbed too soon, no matter how dry the undercoat may be. In other words, if a coat of rubbing varnish is applied over a coat of shellac which is bone dry, this rubbing varnish will sweat if it is rubbed before it is thoroughly dried through.

In rubbing a wet coat of varnish the outer shell, or the greater part of it, is rubbed off and the inner part of the coat of varnish, which has not had time to oxidize or dry through properly, will gloss back again after rubbing. This condition is called sweating.—Fred Rosen.

Thinks Caustic Soda O. K. For Metal.

In regard to correction of error (Feb., page 27) on A. F. Eibell's article, about use of caustic soda, personally I do not see his mistake. True, I would not recommend it for furniture as it turns the wood brown, but for the metal of automobile bodies, I rather like it. I am a foreman finisher in a piano factory, but I do some automobile re-painting during spare time.

I read Mr. Eibell's original article in January Industrial Finishing and tried out his recommendations, being careful about my hands, however. I dissolved caustic soda in water, put it on body, let it stand one hour and then scrubbed it off with scrubbing brush and water. It worked fine. The smallest amount I could buy was 5 pounds for 75c, and this I considered was the cheapest remover I could find. No odor to soda, and no need of scrubbing with benzine to clean off body afterward. Soda will not injure the enamel on fenders like some commercial removers.

Understand I am not knocking commercial varnish removers, as I use them for several different kinds of work, but for the automobile body jobs I get good results, and so far have had no trouble.—L. S. Decker.

Fillers For Black Walnut.

When I was a cub, working in an undertaker's cabinet shop, together with two other boys, we used to fill what we boys called "walnut overcoats" with copal varnish, applying the varnish coat by coat and rubbing it in, each coat as soon as it was nearly dry, by means of a soft pine tool shaped like a chisel. We called it "sticking", a very appropriate term. It required several coats to fill the wood so that a coat of varnish would stand out on it.

One of the early-day fillers that we used when we did not wish to darken the wood too much was made as follows: Take equal parts of boiled linseed oil, turpentine and brown japan; mix into this liquid rye or wheat flour, colored a trifle with burnt umber, forming a paste, then running it through a hand mill.

Another filler: Mix together equal parts of black japan, brown japan, and either raw or boiled linseed oil. To a gallon of this was added a pint of turpentine.

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Bronze Ornaments
Barber Chairs
Cedar Chests
Clocks
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Chairs
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Coasters
Caskets
Church Furniture
Costumers
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Then add sufficient floated silica and six parts of dry Vandyke brown to the silica, all forming a dough-like mass. If desired to have a darker effect, or darker pores, drop black was added.

If you wish to make walnut dark, and your stain is not dark enough for your purpose, don't add more color to the stain; that will overload it and give you a muddled effect. It will cloud the fine markings of the wood. Years ago walnut used to be darkened so that it resembled ebony, rather than its natural self.—A. A. K.

Bloom on Varnish Finish.

After an article has been varnished and finished and then left to stand in the storage or show room for some time, a bloom gathers on the surface. Wash off and rub a little with water and vinegar—a tablespoonful of the latter with a quart of the former liquid. Carriage painters take a vehicle in this condition and spray cold water over it.

To wash off with slightly soured water, saturate some cheese cloth with the water and wring it out as dry as possible. Rub the varnished or polished surface with the cloth, rubbing with care, to avoid marking the varnish. Follow by drying the surface with a piece of clean, dry cheesecloth. If the method should fail, try it again in about one week, after which wash off with clear water. This ordinarily brings the object out like new.—E. F. Taft.

Gilding Small Surfaces.

To gild a wood surface of any size the wood must first be made perfectly smooth by the use of very fine sandpaper. Then apply three or four coats of thin shellac allowing each coat to dry thoroughly, and sand well with fine sandpaper before the next coat is applied. The object of using very thin shellac is to avoid brush marks. The last coat should be sanded with No. 0000 paper.

Make a gilding size by mixing one tablespoonful of pure raw linseed oil in one-half pint of good varnish, and thin this mixture with one tablespoonful of pure turpentine. The purpose of the linseed oil is to keep the size tacky for a time after it is applied and begins to set. Without the oil the size is apt to harden too rapidly after it has set sufficiently to permit rubbing on the gilding powder. Apply to the surface to be gilded, a medium coat of the size and allow it to stand until it becomes tacky.

Make a soft pad by covering a small ball of waste cotton, or other soft material, with a piece of velvet, leaving the velvety side out and tying the ends of the velvet about the cotton with a string.

Have at hand a package of gilding powder, or bronze powder as it is frequently called, and when the size is tacky enough dip the velvet pad in the powder and rub it gently but quickly over the sized surface. Rub with a circular motion, covering the whole surface in this way. Keep the pad well supplied with the powder, as otherwise it is apt to stick to the size. Keep rubbing the powder in, until the size has taken up as much as possible. This method produces a very smooth, burnished-like effect.

To produce a more "glistening" effect, instead of rubbing the powder in with the pad, sift it on by means of a salt or pepper shaker, making sure to cover every part of the surface. When

using this method do not allow the size to become tacky. Merely give the size plenty of time to flow out evenly; then sift on the powder. The powder will adhere uniformly if the coat of size has been applied evenly and cleanly.

Do this work over a large sheet of paper spread out over the table, so as to catch and save any powder that does not adhere to the size. When the whole has been covered, hold the article in the required position and tap it gently to jar off any surplus powder. After 24 hours dust off gently with a camel hair duster.

If it is desired to ornament a gilded surface with some other color, a good way to proceed is as follows: Cut out of heavy bond or ledger paper, the desired pattern; with the aid of this, mark the shape of the ornamentation on the gilded surface. Take a camel-hair pencil brush and fill in with size the spaces to be ornamented, applying a uniformly thin coat. As soon as the size is applied sprinkle it with powder of the desired kind and color. If the ornamentation is made up of two or more colors, each color must be put on separately, in order that the first may dry so that the subsequent color will not mix with it. Sometimes beautiful effects are produced by mixing two or more of the dry powders in any desired proportion.

For certain kinds of work the gilding may be done by mixing the powder with the size, and applying with a fine brush. When doing this use damar varnish thinned with turpentine, and do not use any oil. Do not mix more powder than is required for immediate use. Some powders discolor if left mixed with size for a few hours. When the ornamentation is put on with a brush

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the different colors may be put on, one immediately after the other. It is only when the colors are sifted on that one must dry before the next is put on.—Ted V. Toby.

Wood Staining.

The staining of wood may be roughly divided into at least four classes—water staining, oil staining, turpentine staining and varnish staining.

A water stain is a transparent, colored solution obtained from coloring substances which are soluble in water and which have no body, as walnut juice, logwood extract, gamboge, tumeric, indigo, the juice of berries and bark of trees, and some pigments having little body as prussian blue, burnt and raw sienna, vandyke brown and alkaline dyes. They are best applied with a sponge, and several thin coats give a better effect than one heavy coat. Each coat should be dry before applying the next one. Warm distilled water is best.

Water coating is the use of body colors ground in water, as ochres, umber, venetian red, chrome, drop black, etc. It is a form of distempering, differing, however, in the fact that coloring material is not all left upon the wood to dry. Size is added to bind the color, as in distempering. This process of course hides the natural grain of the wood somewhat and disguises the shortcomings and defects of certain woods.

Oil stains are oil colors of a more or less transparent nature, as the siennas, vandyke brown, prussian blue and brown, and the aniline and cochineal lakes. Oil stains color the surface but do

not hide it. Before using oil stains it is best though not essential that a coat consisting of seventy-five per cent turpentine and twenty-fiye per cent boiled linseed oil be applied first. It will be found that the stain will then color the surface more uniformly and brush on more evenly.

Turpentine staining is akin to oil staining. Certain aniline and other dyes mix more readily in turpentine than they do in oil or water and consequently are used in this form. The danger of anilines as coloring materials is that they may cause succeeding coats of varnish to "bloom."

Denatured alcohol is often used instead of turpentine. It must be hot for best results. To eliminate the danger of placing the alcohol directly on the fire, it is placed in a pail of hot sand or boiling water to heat it. A gallon would be used for two ounces of the dry aniline colors. The colors are first dissolved in one quart of hot alcohol and the other three quarts are added cold.

Varnish stains are similar to oil stains except that varnish is added to stop absorption and prepare the work for varnishing or surface polishing. They color the wood, fill it to a certain degree and give it a gloss finish all in one coat. On floors, varnish stains are in nearly all cases more serviceable than oil, water or spirit stains.

Oak and other hardwoods are often wax-stained and polished by hand. Wax stains are made from a mixture of beeswax and turpentine and oil colors, such as vandyke brown, burnt sienna, etc. They are applied freely when warm on hard woods and when well soaked in and hardened, say

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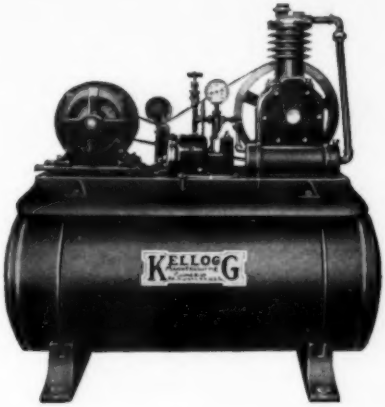

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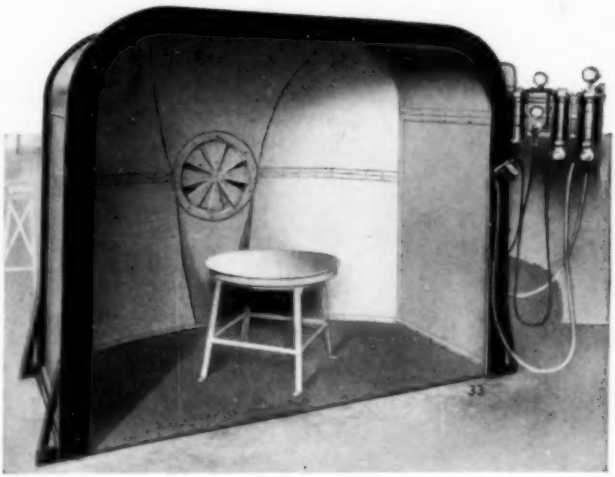

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